

LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, April 22-26, 2013.



WATCH OUT FOR THAT ASTEROID



Lawrence Livermore has created computer simulations to show that an explosion could break a large inbound asteroid into smaller chunks that would miss the planet. Credit: NASA

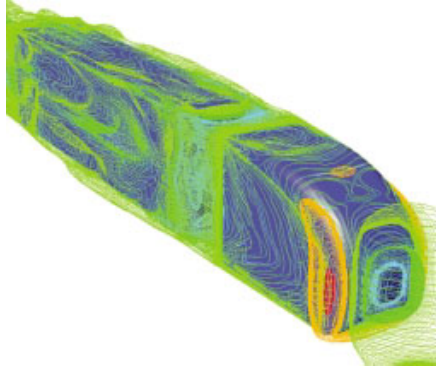
Protecting the planet from an inbound asteroid is no easy feat.

An explosion could work to break up the asteroid; scientists at Lawrence Livermore are studying what effect an explosion would have.

"Nuclear explosions can provide an effective option for many threat scenarios," said Lab physicist Paul Miller.

Breaking an asteroid into several pieces could potentially create a larger threat than the initial asteroid, Miller said. Instead, his proposal is to create a cloud of small chunks that would miss Earth altogether. Computer simulations show this is possible.

To read more, go to TMC.net.



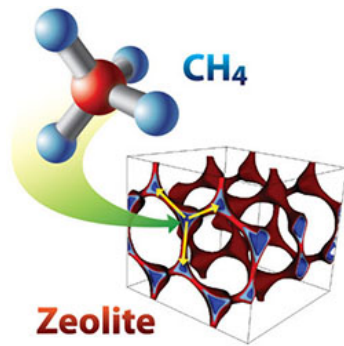
The Laboratory is working on devices to limit the drag for semi trucks.

With fuel prices -- particularly diesel -- historically high, costs are a major concern for trucking companies. As a result, there has been burgeoning interest in new truck designs that make use of better aerodynamics to cut fuel consumption and emissions.

According to Kambiz Salari, senior research scientist at the aerodynamics research group at Lawrence Livermore, drivers can immediately feel a difference when aerodynamic add-ons are installed.

"When trailer skirts and tail devices are installed, drivers often report a sense of improved vehicle handling under windy conditions," Salari said. "These treatments also reduce the wake of the vehicle and, hence, the wind buffeting experienced by [trailing] vehicles. With proper tractor drive axle skirts, trailer bogie skirts and tires, splash-and-spray can be minimized under rainy conditions. As a result, visibility can be improved for [trailing] and adjacent vehicles."

To read more, go to ThomasNet.com.



The metal zeolite may be optimal for trapping methane.

As concern over atmospheric methane's contribution to global warming grows, scientists working for Lawrence Livermore and the University of California, Berkeley have found new ways to capture this elusive gas.

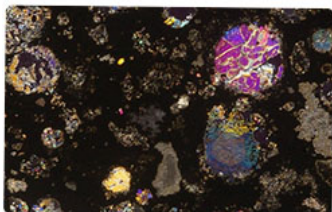
Unlike carbon dioxide, the most infamous greenhouse gas, methane is "non-polar," meaning it doesn't have a positive charge in some places and a negative charge in others. So it doesn't interact strongly with other molecules, making it much harder to scrub from the air.

Livermore's Amitesh Maiti, Roger Aines and Josh Stolaroff, working with colleagues have found "a handful" of solid, porous substances called zeolites that could be used to scrub methane from the air. They tested some 87,000 zeolites during their research.

To read more, go to [San Francisco Business Journal](#).



DEATH OF STAR BRINGS LIFE TO OUR WORLD



The Allende meteorite may provide clues to the formation of our solar system.

The dust grains that eventually coalesced into our solar system's planets bounced around over vast distances nearly 4.6 billion years ago. Some of these dust grains were found on a rare type of meteorite known as a carbonaceous chondrite, which fell as a fireball near the village of Pueblito de Allende, in the Mexican state of Chihuahua, on February 8, 1969.

The Allende meteorite also contains fine-grained, microscopic diamonds with strange isotopic signatures that point to an extrasolar origin; these interstellar grains are older than the solar system and probably the product of a nearby supernova, a new report by Lawrence Livermore researchers and colleagues concludes.

Scientists studying a tiny chunk of the meteorite say it likely formed close to the sun, was ejected near today's asteroid belt, and then returned to the scorching inner reaches thereafter. The results should help astronomers better understand the early days of our solar system, and could shed light on planet-formation processes in general, researchers said.

"It is a useful framework for trying to understand how material originally formed near the sun can end up out in the asteroid belt," said study co-author Ian Hutcheon, of Lawrence Livermore.

To read more, go to [The Daily Galaxy](#).



SEQUOIA BRANCHES OUT TO CLASSIFIED WORK



The Sequoia supercomputer has gone classified.

Lawrence Livermore's Sequoia supercomputer is branching out to the national security field.

It has completed its transition to classified computing in support of the Stockpile Stewardship Program, which helps the United States ensure the safety, security and effectiveness of its aging nuclear weapons stockpile in the absence of underground testing.

The 20-petaflop (quadrillion floating point operations per second) IBM BlueGene/Q system is dedicated exclusively to the National Nuclear Security Administration's Advanced Simulation and Computing (ASC) program. ASC is a tri-lab effort drawing on the computational engineering and scientific computing expertise at Los Alamos, Sandia and Lawrence Livermore national laboratories.

Delivered and deployed in early 2012, the 96-rack Sequoia machine not only took the No. 1 ranking on the June 2012 Top500 list of the world's most powerful supercomputers, it also was rated as the world's most energy efficient system and earned top honors on the Graph500 list for its ability to solve big data problems -- finding the proverbial needle in the haystack. While Sequoia dropped to No. 2 on the November 2012 Top500 list, it remains one of the most energy efficient HPC systems and retained its No. 1 Graph500 ranking.

To read more, go to [Scientific Computing World](#).

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#).